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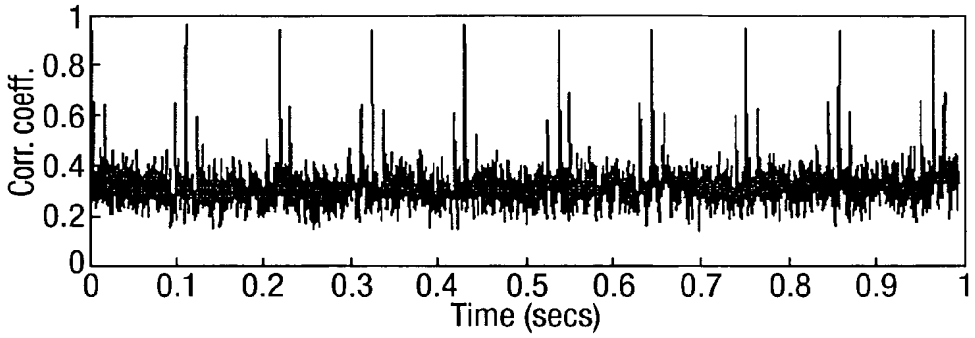
(54) Title: FREQUENCY COMPENSATED COMMUNICATIONS RECEPTION



$$\|\alpha\mathbf{x} - \mathbf{CFv}\|^2 + \lambda\left(\alpha^* \mathbf{x}^H \mathbf{x}\alpha - 1\right) \quad \text{(I)}$$

$$\|\mathbf{Xw} - \mathbf{CFv}\|^2 + \lambda\left(\mathbf{w}^H \mathbf{X}^H \mathbf{Xw} - 1\right) \quad \text{(II)}$$

(57) **Abstract:** Frequency compensated communications reception includes compensating for frequency offset in a received signal by constructing a reference signal for comparison with a training sequence in a received signal. The reference signal is formed from basis functions and the training sequence. It is obtained by minimising a cost function *J* constructed from an adaptively weighted combination of basis functions, the training sequence, the received signal and a constraint requiring non-zero signal power. Multi-element antenna signals are weighted with a beamforming weight vector w in *J* given by formula (I), where X is a matrix of received signal samples, C is a diagonal matrix containing elements of the training sequence, F is a matrix having columns defining basis functions, v is a vector of adaptive weights, index *H* indicates complex conjugate transpose and λ is a Lagrange multiplier constraining beamformer power. A single element antenna signal x is scaled in *J* given by formula (II), where α is a scaling factor, * indicates a complex conjugate, and x is a vector of received signal samples.

WO 2005/081484 A1

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